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SYNTAX

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Lecture Notes (1)

Abstract These notes define the specific object of inquiry of syntax as independent of semantics and phonology yet interfacing with them. Then the exposition introduces the Principles and Parameters Hypothesis and the Minimalist Program outlining the criteria of adequacy for any theory of grammar. Relatedly the representational system of Tree Diagramming is introduced where syntactic relations are defined through tree relations and the nature of the major syntactic operation Merge is explained accordingly as motivated by feature checking. Finally, the theta-criterion is explored.

What is it that we've been doing?

Let's start from the beginning, from the first observation we made. A much used definition of the object of our study, "language", is that **Language is simply sound that has meaning**: native speakers of a language can do at least two things in this regard:

A. They can speak 'correctly'.
B. They can understand the meaning of others' speech.

In other words, native speakers can put words/sounds into meaningful combinations according to certain rules of combination. It is these rules of combination that we are concerned with and that we call **syntax**. This is the subject of our course and the task in front of us.

How do we find out what these rules of combination are? Unfortunately, the native speakers of the language are of no help in this regard. When asked how they're able

to put words together into well-formed and meaningful combinations, the native speakers of a language would usually respond that they just could. In other words, whatever enables them to do that is not an **explicit** form of knowledge about their language, something that they learned through instruction in a formal or informal setting. So we say that the knowledge a native speaker has of her language is **tacit** rather than *explicit*. It falls on us as people interested in this type of knowledge, as syntacticians, to make it *explicit*. That is, then, what we've been doing in a nutshell.

But what exactly do the two points above entail? Well, quite a lot actually. It turns out the native speaker's tacit knowledge of her language is very complex. Let's say our speaker's native (or sometimes we say "first language," as in the one she acquired from her speech community as a child) is English. As a speaker of English as a first language she is able to judge some combinations of words as "English" and others as "Not English." For example, any native speaker of English would judge (1) as acceptable in English, but not (2):

1. The child slept peacefully last night.
2. *Slept night child peacefully last the.

Although (1) and (2) have the same words in them, our native speaker, though she may recognize the 'words' in (2), would not accept the 'order' in which they are put. In fact, (2) is usually described as 'a word salad' in that there is no 'order' to the words. She would, however, accept the order in which they are put in example (1). We'll adopt the notational convention of marking examples that our native speaker of English does not accept with an asterisk (*) as in example (2). And we will call this transaction between us and the native speaker of the language "acceptability judgements." In other words, we'll continue to pose examples to our imaginary native speaker and proceed based on whether she judges them to be acceptable or not acceptable. Thus, our task is in part to study why she accepts (1) and rejects (2), among many other examples we'll continue to pose to her.

Now, we've made some headway. That our native speaker accepts the first example but not the second one tells us something: **the order of words is important**. But still, our native speaker would not be able to tell us *how* the words should be ordered or *why* they are ordered in this and not in any other possible way.

And there's more to it. Observe the examples below:

3. Last night, the child slept peacefully.
4. *Night, the child slept peacefully last.

Now, what we did was rearrange some words in (3) and (4). (3) is acceptable; (4) is not. Can we describe what we did in these two examples? Yes.

Informal Description: From example (1) we moved the last two words to the front of all the other words – to the front of the sentence, that is. In (4), we only moved the last word from (1) to the beginning.

Can we explain why (3) is acceptable and (4) is not? We can try:

Informal Explanation: you can only move the two final words together in examples like (1) to the front.

This would indeed exclude (4) and explain why it is unacceptable, but it would also exclude (7) and accept (6) based on the initial state of words in example (5) below.

5. The child slept peacefully in his new bed.
6. *New bed, the child slept peacefully in his.
7. In his new bed, the child slept peacefully.

Our initial informal explanation above would include (6) as acceptable – because we only moved the last two words of the example to the front – and would exclude (7) as unacceptable – because we fronted more than two words, four to be exact. This is contrary to the facts, however, as our native speaker would reject (6), but would accept (7).

Ok, this is much more difficult than we perhaps had imagined. But our first attempt here at describing and explaining the facts of language has not been completely unfruitful. Now we know three things:

- Acceptability judgements of the native speaker in part have to do with the order of the words.
- Word order can be rearranged, but we're not completely free in that regard. Certain rearrangements are allowed; others are not.
- Whatever is at work in the acceptable arrangement of words, it does not seem to depend on the number of words in the original example, or the number of words whose place we change. It must depend on something else.

Ok, good, now we're getting somewhere. We're accumulating observations about **the possible order of words and the impossible order of words in a sentence**. And we're at a place to make a tentative generalization from our observations about facts of language from the data in examples (1) through (7).

> **First Generalization**: Certain things are *allowed* and certain things are *disallowed* in the putting of words together to form *acceptable* combinations.

They are *acceptable*, that is, according to the judgements of the native speaker of English. This seems to hold for other languages as well. The native speaker's tacit knowledge of acceptable combinations in her language is called **competence**. Her actual speech, however, is a matter of **performance**. Note that competence, once achieved, is stable. It does not disappear when she sleeps, for instance. She will wake up the next morning still able to issue acceptability judgements about the relevant facts of language we're concerned with here. Performance, on the other hand, may be impaired due to many things like the effects of alcohol, drugs, or fatigue where 'mistakes' may be committed. So, we can say that we can disregard occasional mistakes in performance and focus our study on competence. But how do we do that? We have to clear out many misunderstandings about what it means to achieve competence in a language before we can meaningfully address this question.

Observe example (1) above in a, more or less, literal translation into Classical Arabic in (8) below:

8. nama al-tiflu [nawman] hadi'an laylata al-'ams.[1]

It seems that for (1) to be acceptable for a native speaker of Classical Arabic, the word order has to be changed from that of English. Crucial here is that whereas the English example starts with *the child*, which in grammatical terms, you may recall, functions as **subject**, the Arabic example starts with *nama*, "slept," the **verb**. Furthermore, whereas, the English *the child* counts as two words, the Arabic *al-tiflu* counts as one word. So there are crucial differences. One major difference we may note is that the English sentence starts with the subject whereas the Arabic sentence starts with the verb. Another important difference is that the notion of *word* seems to be a matter of spelling/writing convention as Arabic counts as one word what are two words in English and so we need to calibrate the notion of word further. But our first generalization about English still holds for Arabic. Note the acceptability of (9) and the unacceptability of (10) based on (8):

9. laylata al-'amsi nama al-tiflu [nawman] hadi'an.
10. *laylata nama al-tiflu [nawman] hadi'an al-'ams.

Thus, if indeed we are attempting to describe and explain the native speaker's knowledge of her language, we should do that for the native speaker of any language, be it English, Arabic, French, or any other *natural* language. We say "natural" because we're not concerned with artificial languages like programming languages or ones constructed by linguists for science fiction novels and films. We're only concerned to describe and explain languages acquired in a 'natural' setting within a speech community.

Now, as with any form of judgement, "acceptability judgments" must issue from certain criteria, or *principles*. Furthermore, when we say "the native speaker" of language, we mean all those who have acquired the language from the same speech community as children. In other words, acceptability judgments are not personal or specific to one individual. They are shared by the speech community, the people who speak the same language as their first language. And for all these native speakers of the language, these *principles* are *tacit*, not *explicit*. So, in part these principles are what define someone as a native speaker of a language.

We have now understood better the 'nature' of the phenomena we're attempting to describe and explain. We want to make *explicit* the *tacit* knowledge of the native speaker of a language in regards to the putting together of words into acceptable sentences. This is what we call *grammar*, or to limit its scope more, *morphosyntax*, but more on that below.

[1] Note that I am using very broad transcription sometimes using symbols that are not in the IPA here and will continue to do so as it won't be necessary to do narrow transcription for the purposes of our discussion throughout the course.

How do we do that?

Well, historically, there have been many attempts to do that. So, we start from there. The type of inquiry that has historically concerned itself with this question, albeit through different formulations of the question and for different reasons, is called **grammar**. But, "traditional grammar" has concerned itself with the description of one language only. Thus, there are grammars written to describe the facts of English, others to describe the facts of Arabic, and others still to describe the facts of French, and so and so forth. In other words, the descriptions these grammars provide are language specific: What goes for Arabic does not necessarily go for English and vice versa and so on and so forth for all other natural languages which have written grammars. We say "which have written grammars" because not all natural languages have written grammars. The majority also do not have a writing system or script, but very much exhibit the same complexity of phenomena we noted for English and Arabic.

Furthermore, we know that the facts of language change. Thus, the descriptive grammar for Classical Arabic is not suitable for the contemporary facts of Arabic as it is spoken in a wide range of speech communities whose language we call Arabic. The distinction between *fussha* and '*amiyah* is not a distinction between a language that has a grammar (the former) and one that does not (the latter) as some may believe. Both have a grammar, but differ in a wide range of aspects including word order and word endings. Here is (8) in, a more or less, literal translation into contemporary Palestinian Arabic in (11) below:

11. el-walad nam [noum] hady mbeireh.

(11) is acceptable for native speakers of contemporary Palestinian Arabic and so should not be excluded from our purview. Interestingly, here, note that what has changed is word order and word ending: Palestinian Arabic is closer to English in its word order and just like English does not add special endings – what you learned to call "inflectional suffixes" in other courses – to words. Nor is this aspect of a "formal" and an "informal" or colloquial *register* of speech specific to Arabic. Many other languages have this distinction. There are formal "rules" of grammar in English that the speech and acceptability judgments of the native speakers of the language do not manifest or support. One such rule is: "Never end a sentence with a preposition!"[2] This would exclude a sentence like (12) below although it is acceptable for the native speaker of the language:

12. This is the closet which I put my clothes in.

The *prescriptive* rule excludes (12) and corrects it as "This is the closet *in* which I put my clothes" against the actual speech of the native speaker of English. When such grammars are invoked, we say that they are "**prescriptive**," that is, they prescribe or tell the native speaker how she *should* speak. It is clear from our

[2] I realize this introduces terminology like 'sentence' and 'preposition' that we haven't yet introduced in our discussion, but I'm sure you all have a notion of what they are. Later we will of course introduce them in a more concise manner.

discussion thus far that our approach is "**descriptive**," that is, it describes how the native speaker of the language actually speaks without attempting to 'correct' her speech. In short, 'grammatical' for us will mean 'judged acceptable' by the native speaker of the language, and 'ungrammatical' will mean to us 'judged unacceptable' by the native speaker. Having laid this ground for **grammaticality**, we can now come back to the question from which we started.

So, we've made some progress in our attempt to answer the question "how do we do that?" which we started from above (I've just doubly violated the prescriptive rule about prepositions) in regards to making explicit the tacit knowledge of the native speaker of her language. This is actually called the "scientific study of language," as you may well know from other courses you've taken in **linguistics**.

Building on traditional grammars, researchers concerned with this and similar questions have adopted a 'scientific' approach to answering it. To judge something as a 'science' or as 'scientific' is primarily a question of method, or simply, of the way one goes about answering the question. In short, the scientific method in this context is a matter of: observing a phenomenon, collecting data, formulating hypotheses, and testing these with the collection of more data, and so on the cycle of hypothesizing and testing through data continues. This is what we did above. However, ultimately, this type of research should at a certain point build a 'theory' which is able to account for the facts of language and guide this process in terms of what questions are relevant, how they are researched, and what the ultimate goal of all this labor is – that is, why should we do this or "Why do we care?".

Well, we care for many reasons. One important reason is if language is a specifically human attribute, we think answering this question can tell us something about what it is to be human. But, there are also other compelling reasons that will become clearer as we proceed. Now, the more important question is the "How" question. Sometimes, looking at other fields of scientific inquiry helps through analogy. Take Chemistry for instance: The periodic table has had more elements added to it more recently, but it itself remains a very robust way of describing and explaining the structure of elements and the rules of their combination in the creation of compounds in a very minimal form of representation. In short, it is a way of representing a description of the nature of elements and of explaining and in turn predicting their behavior. We aspire to that form of description, explanation, and prediction.

The very famous linguist Noam Chomsky, whose work and that of others who followed his forceful lead we will be studying in this course, calls these **levels of adequacy** for any theory of grammar: A theory that achieves **observational** adequacy is one that achieves an exhaustive enumeration of all the relevant facts of language. This could work for a language specific grammar, say of a grammar of English alone, but not for the task we set for ourselves above. The second level of adequacy is **descriptive** adequacy. This is a theory that is able to describe all of the relevant and only the relevant facts of language (This is something that you studied as "the **all-and-only criteria**" in Introduction to Linguistics). But there is a higher degree of adequacy that Chomsky challenges a theory of grammar to achieve which

he calls **explanatory** adequacy. In order to understand this last one we need to make some initial observations about how a child acquires a language.

First, note that we've been saying that a child *acquires* a language. This is because we don't think that she *learns* it. Here is the difference between *acquisition* and *learning*: Acquisition is an unconscious process which happens regardless of focus, effort, and intent. It is spontaneous rather than deliberate. It further downplays the role of the teacher. That is, no dedicated teacher or teaching environment is necessary for acquisition to take place. You only need to place the child among speakers of the language interacting with each other for her to acquire regardless of her level of intelligence or her motivation and any other such factors that seem to play a role in learning other skills. Learning on the other hand, assumes conscious effort, focus, and intent and further assumes a teacher and an instructional context. So why do we think a child acquires rather than learns her first language? Here is why:

Compare a child acquiring a first language from her speech community and an adult learning a language in a formal teaching setting or even a natural setting:

- The child is always successful in achieving native skill in the language and this is a fact for all children in all speech communities; the adult will rarely achieve a state approximating a native speaker and will vary in terms their competence depending in part on the factors that we mentioned would play a role in learning a skill above.
- The child's acquisition proceeds effortlessly and doesn't seem to benefit from instruction; the adult learner is in need of conscious processing of data and benefits from instruction.

There is more to the contrast than those two points, but they will suffice here to demonstrate the difference between learning and acquisition. Noam Chomsky takes this further, however. He insists that the child is born with a language faculty or a language organ, or a language instinct as Steven Pinker has called it. What Chomsky insists on here is that it is impossible to account for the speech of a child based on environment alone. The child will produce errors and novel constructions that she has never heard before. If never heard before, how does the child come to produce these novel constructions or commit these novel systematic errors that adults around her do not make?[3] This is sometimes called the "**poverty of the stimulus**" argument, because at the time it was first advanced, Chomsky was arguing against the behaviorist accounting of linguistic facts as explainable in term of the behaviorists' famous **'stimulus ----> response'** equation, that is, that the child merely imitates the speech of people around her, what the behaviorists call "internalized verbal habits." Thus, Chomsky asks where these novel constructions and errors that the child produces come from since they cannot be attested in the speech of adults around her. His answer is that the child is born with **innate**

[3] Note that these errors are systematic in the sense that they are committed by all children learning a language significantly frequently and seem to have equivalencies cross-linguistically, i.e., parallels from other languages. Therefore, they seem to indicate something other than the mistakes in performance we noted for adults speakers.

mechanisms for the acquisition of language based on an initial state of grammar that he calls **Universal Grammar (UG)**. This is the third and highest criterion of adequacy that he proposes for a theory of grammar: It should be able to provide a model of how a child comes to acquire her first language and the initial state of UG. This means that for any grammar of any language, an explanatorily adequate theory of grammar would allow us to derive that grammar from UG. We will have more to say on this below.

For now, let's note the fact that children seem to acquire language in a systematic, uniform, and rapid manner. Systematic and uniform means that they all seem to go through the same stages of acquisition at the same ages committing the same errors in production, but not others. Rapidly means that it seems to proceed very quickly after the first year of age and to take off at a remarkable rate after the second year where they achieve adult competence in their language at age 5-7. This is not the case for adults as we observed above. In fact, children seem to loose that ability after a certain age (this is called the "critical age hypothesis"). Thus, we think that whatever it is children bring with them to the task of acquisition, it seems to involve certain constraints on what is a possible human language which would simplify the task of acquisition a great deal and would also explain why they commit the same types of errors systematically, i.e., as they're trying to see which of the possible human languages allowed by UG, theirs belongs to. Let's put this in a more precise language: There are certain innate aspects of language that the child is born with. They include **principles** for what is a possible human language, or in other words, principles that are shared among all languages in terms of putting words together that no language violates (word order or **syntax**, which simply means the combination of words into acceptable structures) and certain aspects that vary from one language to another according to predefined possible values. Let's call the latter **parameters**. This approach is called the **Principles and Parameters Hypothesis (P&P)**.

Thus, it is Universal Grammar that is the object of our research rather than the specific grammar of a language like English or Arabic. But we need to zoom in more closely on what we mean by this. First distinction, we're not concerned with the acquisition of **phonology** and constraints on phonological systems and errors in pronunciation. We're also not concerned with what a word means in a specific language and how to translate it into another. This would be the domain of **semantics and pragmatics**. We will have things to say about such facts of language later, but only to the extent that they have a role to play in what we call **syntax** or grammar understood here as **morphosyntax (i.e., morphology and syntax)**. There is a lot to unpack in these last statements and we will do exactly that. But now, we're at a place to use a more concise and precise technical terminology in our inquiry.

We have set ourselves the task of describing and explaining the competence that underlies the native speaker's performance in her language. We have used English and Arabic to draw examples of such knowledge and have noted that it involves order of words in sentences and the interpretation of these sentences. Let's make some more necessary distinctions for us to achieve our task.

Let's say that wherever you find an instance where a combination of words in speech or writing is acceptable, we will call this an **utterance**. Let's also say that an utterance which expresses what traditional grammarians call a 'complete thought', stands for a sentence. Accordingly, **sentence** is an abstract construct rather than its material manifestation in speech or writing. This would also mean that it is as such in the purview of our area of study, **syntax**. Finally, let's call the meaning of a sentence a **proposition** and define that as the claim of the sentence which can be evaluated in terms of its truth or falsity. You will have noticed that the proposition comes in the purview of the language study that we call **semantics**. These distinctions are the ones you've studied in other courses, but we've calibrated them further here. Thus, we may define syntax as the study of the formation and interpretation of sentences, or the structure of sentences and their meaning that is a function of that structure. Notice that syntax will interface with phonology and with semantics, but that we can study it on its own. Chomsky calls this **"the autonomy of syntax"** hypothesis, that is that the constraints that we've been alluding to are specific to syntax and the acceptability/grammaticality judgments about sentences can be made relatively separately from their propositional meaning. Here is the famous example that Chomsky proposed to demonstrate this point:

- Colorless green ideas sleep furiously.

The meaning of this sentence (its propositional content) is nonsensical, unless taken metaphorically or in a poetic register (someone actually built a poem around it), but this does not carry over to its form or structure: it is in fact well-formed. Thus, while semantically odd, a sentence can be well-formed. We started from the simple observation according to extant definitions of language as sound that has meaning. Let's say that syntax is what mediates between sound and meaning. **Minimalism** or the **Minimalist Program** takes this to be its central hypothesis. In the more technical language on this, the mind has a division of labor among the various levels of language and is said to have different "**modules**" that are responsible for different aspects of language. There is a module responsible for thinking and reasoning called "**the conceptual-intensional**" system (Concepts and the 'objects' they pick out, i.e., objects of thought). There is another module responsible for perception and articulation called "**the articulatory-perceptual system**" (runs our perception and mapping of things into language as well as our articulation of it). Syntax mediates between these two systems and is independent of both. It generates structures for both of these systems which they can "**interpret**" or "use." Thus, there are **properties/features** and structures that syntax provides these two systems with and which they can use (we will call these "**interpretable features**") and others which they cannot use (we will call these "**uninterpretable features**"). But what are 'properties' or 'features'?

Well, you may remember this from other courses like Introduction to Linguistics and Phonetics and Phonology. There you may have learned that a *phone* can be thought of as a bundle of articulatory gestures or acoustic properties/features which can be formalized (that is represented into a type of mathematical/symbolic system) as **distinctive features** and that, in turn, the difference between different

phones is sometimes the difference in the "value" of one such feature. For instance the phone [p] is described as [voiceless, bilabial, stop] and [b] is described as [voiced, bilabial, stop]. The first term in the matrix specifies voicing; the second, place; the third, manner. {p, b} is the class of bilabial stops in English. You may have also learned to put some or all of these features in terms of pluses to indicate that a certain feature is present and minuses to indicate that a certain feature is not present, or that its value is the other of a binary possibility, i.e., where there are only two possible options. For example, [p] is [-V] and [b] is [+V] and these two values specify the binary system of voicing. Now, all of this is phonological and is as such part of the articulatory-perceptual system.

You may also have learned in previous courses that we can also formalize the meaning of words in a similar manner into what are called **semantic features**. For example, we can think of the meaning of the word "boy" as a bundle of the following semantic features: [+male, +human, -adult]. Now the word "girl" would have the same features except for the one that specifies sex, i.e., "girl" is [+female, +human, -adult]. So, sex is a binary system in semantics, just like voicing is in phonology. The term 'human' specifies *species* and the term 'adult' specifies *maturity*. We can further extend this and think that *cub* and *boy* contrast in terms of species and that *boy* and *man* contrast in terms of maturity. We can also think that they all share the feature *mammal* and in turn this would contrast with *reptilian*, for instance.

Now all of this is approximate as the point here is to remind you that we have been using the notion of feature or property in pervious courses. What we want to do now is calibrate this system as we proceed for the purposes of syntax. In other words, we want to formalize our knowledge of language, that is, to provide a system of (mathematical) representation that captures the relevant facts.

Let's do that for what you already know about the grammatical properties of words. Following our suggestion above, let's think of a grammatical category as a class of words that share certain grammatical (morphosyntactic) properties or features. We know the major classes to be nouns (N), verbs (V), adjectives (A), Adverbs (Adv), and prepositions (P). Thus, we can think of the category nouns as all the words that share the feature [N] and the category verbs as all the words that share the feature [V] and so on and so forth.

You also already know from previous grammar courses that words belong into classes or categories. You may also know that when putting words together into phrases, the category of the words combined plays a crucial role in determining the grammaticality of this operation and the *nature* of the resulting phrase. Let's calibrate this into our new model. Now for each of the major classes we mentioned, there are subclasses. For instance, we know that verbs may be **transitive** or **intransitive**. So a word like 'annoy' has the feature [V] or may be [category: V] specifying that is a verb and a word like 'apple' has the feature [N] or may be [category: N] specifying that it is a noun. Now, the feature transitive for the word 'annoy' specifies something about the word that does not relate to its own category. It actually specifies that the word *needs* something other than itself. What it specifies is that it needs two other words both of which have the property or feature [N]. In

less technical terms, it specifies that it needs two nouns or noun-like structures. Intransitive verbs specify that they need only one word of the category [N]. **Ditransitive** verbs like 'send' specify that they need three lexical items with the category feature [N]. And some specify they don't need any as in weather verbs like 'rain' and 'snow'.

This is all part of the features of the individual words as they are listed in a sort of "mental dictionary," a **lexicon** which we may think of as any actual dictionary. For each individual word, its pronunciation is listed with its various meanings, and its grammatical properties. This is not necessarily part of the system of syntax yet, just the various properties of the word that the child learns from her speech community. Other words specify other types of features. Take the English pronouns. They are specifiable in terms of Person (first person, second person, and third person), Gender (masculine, and feminine), Number (singular and plural), and Case (nominative, accusative, and genitive). Thus a pronoun like *she* has the features [3, fem, sg, nom]. Certain languages like Arabic mark words for agreement in these terms, so that you'd have number, gender, and person features on verbs.

Now for all of these features that we explored here and ones that we will explore later still, they come in two kinds. Each feature can be specified as **interpretable** or **uninterpretable**. As we said above, we want our system/syntax to give to the conceptual-intensional system (semantics) only interpretable features. Therefore, we need *a way of checking and deleting uninterpretable features*. These we will simply notate with a small italic *u*. Interpretable features thus are all features not marked with *u*. Now, certain features on words like gender, person, and number features are interpretable (those are sometimes called **phi-features**) if they specify the word itself as it is in the lexicon. Case is uninterpretable. Features that a word specifies in terms of requirements like "needs one noun" as with intransitive verbs or "needs two nouns" as with transitive ones are also uninterpretable. Agreement features on verbs or any other category are also uninterpretable. This will all make a lot more sense once we put the system to work. But for now, take the word 'annoy' again. We said that it has two [*u*N] features specifying that it needs two nouns or noun-like structures. The way to check (that is, delete or remove) these two features is to provide the word 'annoy' with two lexical items that satisfy that need, that is, that have the feature [N]. This way we can say that the requirement is satisfied or in our more formal terminology that the uninterpretable features are checked before the structure is given to the system of interpretation. In our theory, this is called the "**principle of full interpretability**.

It may help to visualize the various 'modules' through a grid. Here is a possible one:

In simple terms	The Linguistic Subdiscipline	Unit of Analysis	Module	
Meaning	Semantics	Proposition	Conceptual-Intensional System	Logical Form (LF): How a sentence is interpreted
Form/Structure	Syntax	Sentence	**Black Box**: We need to model what happens here, that is, how syntax mediates between sound and meaning.	
Sound	Phonology	Utterance	Perceptual-Articulatory System	Phonetic Form (PF): What a sentence sounds like

So, what do we already know about the 'black box' in the grid above. Well, we know that it is a 'structure,' we know that that structure is 'hierarchical,' and we know that it is **recursive**. Here is how we know all that.

Take a string of words like "The student's paper on the value of honesty." We know that they can occupy different positions in sentences like (13) and (14) below:

13. *The student's paper on the value of honesty* impressed the teacher.
14. The teacher liked *the student's paper on the value of honesty*.

We also know that we can replace that string of words with one word, the word 'it' in this case and we would maintain the grammaticality and interpretation of both sentences, assuming that (15) and (16) below respectively refer to the same situation as (13) and (14) above.

15. *It* impressed the teacher.
16. The teacher liked *it*.

In previous grammar courses, you may have been calling such a string of words a **phrase**. We will continue to do that but will also call it a **constituent**. Thus, a constituent is a grammatical unit, or a string of words that act like one grammatical unit. Note that it can be very long or as short as one word. A word is in itself a grammatical unit just like the *it* in the above examples that replaced/substituted for *The student's paper on the value of honesty*.

These structures, phrases, or constituents can themselves have other constituents in them. We noted that each word is itself a constituent. But note further the following two sentences:

17. The students *ate their dinner* in the campus cafeteria.
18. The students *dined* in the campus cafeteria.

The string of words 'their dinner' is a constituent in (17). We can replace them with the pronoun *it* and maintain grammaticality and the same interpretation. More importantly, the word 'dined' replaces "ate their dinner" and so "ate their dinner" is

also a constituent. Note that we cannot say "*dined their dinner" or "*dined it" as "dined" substitutes for the whole string of words "ate their dinner" and not just for the verb "ate." Accordingly, we can note that the constituent "ate their dinner" contains the constituent "their dinner" within itself. This is what we mean by the observation that the structure is **hierarchical**: constituents contain other constituents within themselves. One way to reflect that would be through **brackets**. Here is how:

[ate [their dinner]]: this tells us that the first constituent "their dinner" is contained within the larger constituent "ate their dinner." We will also use **tree diagrams** later as bracketing tends to get messy with larger and more complex structures.

Now, you probably remember from previous study that each phrase or constituent has a dominant or more central word in it and for which the whole phrase/constituent is labeled. This is sometimes called the **head** of the phrase or the head word, or simply the head. Let's say that the head of a phrase is the word that **projects** its category feature onto the phrase. Thus the structure "ate their dinner" is a verb phrase because it can only be replaced by a verb like "dined." In other words, the *replacement test* can also tell us about the category feature of the projection since it can only be replaced by a word that has the same category feature. This also tells us that a verb phrase essentially acts like a verb. Thus, more generally "combining words into phrases or larger constituents" simply means that we take two constituents (which can be two words, or a word and a phrase/constituent that we already built from combining two words, and so on so forth) and **merge** them together into one larger constituent. This is simply called **merger**, the first important syntactic operation in the formation of sentences.

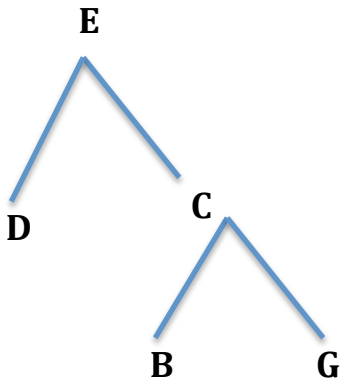
Recursivity may also refer to a characteristic of sentences where structures/phrases of the same type repeat within each other. Take the following example:

19. The students want to take a break.

"take a break" is a verb phrase where "take" is the head. "want to take a break" is also a verb phrase with "want" as head. So, we have a verb phrase inside another verb phrase. You don't need to specify the exact structure at this stage. Just note the fact that a structure of a certain projection may repeat within the same sentence.

Now, the fact about the generation of constituents through **successive binary merger operations** noted above can perhaps be better represented through **tree diagrams**. Let's look at this method of representing structure in the abstract first.

What we're proposing here is merger operations between syntactic units of various structural complexity. Merge only takes two of these at a time. The resulting structure would in turn merge with just one other grammatical unit and so on and so forth. This generates the hierarchical structure that can model grammatical relations between constituents through tree relations. Observe the following abstract tree diagram that represents two merger operations:



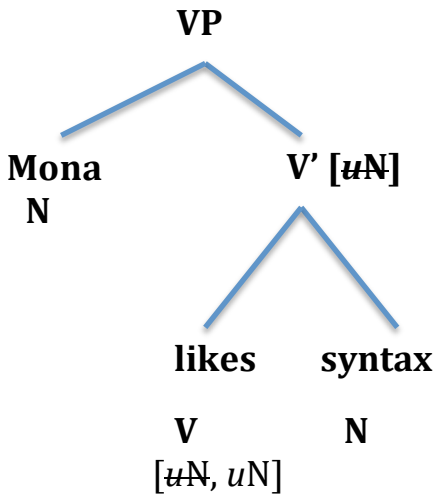
As you can see from the diagram certain tree (structural) relations can be defined for the elements linked through the merger operations:

- One: G, B, C, D, and E are called **nodes**. D, B, G are all **terminal nodes**, i.e., nothing branches out from them. E is the **root node**, i.e., every other node can be traced back to it.
- Two: Each line is called a **branch**.
  Thus, we can say that B and G merge to form C. Or, alternately, that B and G branch out from C. We can also say that D and C merge to form E. Remember that C itself is formed from the merger of B and G.
- Three: A node directly above two lower nodes, is called their **mother.** For example, C is mother to B and G. And, alternately, a node directly below another is its daughter. For example, D is daughter to E.
- Four: A node that merges with another node is called its **sister**. Thus, B and G are sisters, and so are D and C, or alternately, they are said to be in a relation of **sisterhood**.
- Five: Each of these nodes is a constituent regardless of its position in the hierarchy.
- Six: A node **dominates** another node on the tree if it's below it in the hierarchy. These would be all the nodes that would come off the tree if you grabbed a certain node. Thus, C dominates B and G. And E dominates D, C, B, and G.
- Seven: A node **immediately dominates** another node iff (if and only if) it dominates it as per the definition above and is connected to it by only one branch. Thus, C immediately dominates B and G. And E immediately dominates D and C.

The importance of these definitions is that they will give us a way of formalizing grammatical operations and relations as we proceed.

So why do lexical items merge and what happens when they do? Take the following sentence:

20) Mona likes syntax.



The diagram above is very simplified and as you will learn later in the course, the structure is much more complex. But it will do to explain merge and syntactic relations for now.

To wit, the verb "likes" merges with the noun syntax to form the V' (read V-bar) "likes syntax." The merger is motivated by feature checking. Remember that we said transitive verbs have two uninterpretable features [*u*N] specified in their lexical features. Thus the first verb checks one of its [*u*N] by merging with "syntax" [N] forming the phrase "likes syntax." The head of the phrase is the verb "likes" and thus projects its interpretable [V] feature and the remaining [*u*N] feature. This means that the V' still needs to merge with another [N] to check its remaining [*u*N] feature which motivates the second merger operation. Accordingly, the V' "likes syntax" merges with "Mona" to check its [*u*N] forming the VP "Mona likes syntax."

Now in this tree diagram as per the abstract one above, the verb "likes" and the noun "syntax" are sisters, and so are the V' "likes syntax" and the noun "Mona". The VP is the root node and the individual words "Mona," "likes," and "syntax" are terminal nodes. We can also say the VP dominates all the other nodes, but only immediately dominates the node "Mona" [N], and the V' "likes syntax."

Additionally, we can describe the merger operations above in terms of **projections** of the **head**, the verb "likes" and the nouns "Mona" and "syntax." Thus, we can say that "Mona" and "syntax" are **minimal projections** as they don't extend their category feature beyond themselves. The phrase or V' "likes syntax" is an

intermediate projection of the verb "likes" as it still extends further into the **maximal projection** VP "Mona likes syntax."

Note that the **linear order** of the words (the order in which they are pronounced or written) is not the same as the hierarchical structure of the sentence. That the word "Mona" comes first merely means that it has **precedence**, i.e., it precedes the other words, but does not mean that it is the head of the sentence or that it dominates the other constituents.

But how do we determine constituency? Well, there's a battery of tests to do that. One such test is the replacement/substitution test which we made use of in an earlier example. Here is a list of them:

- **Replacement/Substitution test**: we know that a constituent is a group of words that act as a unit. So, it makes sense to say that if we can substitute one word for a group of words and still keep the meaning as close as possible to the original, then the group of words are a constituent. Observe the examples below:

21) The students registered for syntax this semester scored high grades on their first-hour exam.
   a. They scored high grades on their first-hour exam.
   b. The students registered for syntax this semester excelled on their first-hour exam.

Note that the *pronoun* "they" replaces the whole string of words "The students registered for syntax this semester." Thus we conclude that "The students registered for syntax this semester" is a phrase/constituent. We will leave aside for now determining its internal structure and the head of the phrase. You may have been taught to label this as a noun phrase (NP) since the word that replaces it is a pro*noun* (which means a word that can replace a noun or noun-like structure) and that is fine at this stage. Later in the semester, however, we will make a different argument about the structure of noun phrases (NP's) and the distributional properties of pronouns. We will in fact argue that pronouns are part of the category Determiner (D) and that noun phrases (NPs) always extend into determiner phrases (DPs). For now, however, we will continue to label then as NPs.

Less problematically, we can see that we replaced "scored high grades" with the single verb "excelled" which lends support to our intuition that the string of words "scored high grades" is a phrase/constituent. It also tells us that it is a verb phrase since we can only replace it by a word that has the category feature [V]. In other words, the phrase "scored high grades" acts like a verb or has the feature [V] as a projection of the head "scored."

- **Sentence Fragment Test**: if a string of words can be used in a fragmentary response to a question, it is a constituent. Observe the following exchange.

22)
   c. Who scored high grades on their first-hour exam?
   d. The students registered for syntax this semester.

This is similar to the replacement test as the wh-word "who" substitutes for the whole string of words in the answer fragment.

- **Ellipses Test**: Ellipses is the deletion of a string of words from a sentence in a cohesive tie. If you can elide a string of words together, it is a constituent. Observe:

23) My older brother will buy a new car and then I will [buy a new car].

The words in brackets can be deleted because they are said to be retrievable fro the previous mention in the first clause. Thus, "buy a new car" is a constituent.

- **Topicalization Test**: If you can move a string of words together to the front of the sentence (the topical theme position), then they are a constituent. Observe:

24)

e. I like his father, but I do not like his rich uncle.
f. His father I like, but his rich uncle I do not like.

Thus, "his father" and "his rich uncle" are each a constituent.

- **Clefting Test**: Cleft sentences are ones that have the following structure:
  - **It be X that S.**

S stands for sentence, and X stands for any string of words that you're able to move out from S. If the cleft sentence that results from this movement is grammatical then the string of words that is X is a constituent. Observe:

25) The child's parents will take him out of school.

g. It is [the child's parents] that (or who) will take him out of school.
h. It is [take him out of school] that the child's parents will (do).

Caveat One final note on constituency tests: if a constituent fails one constituency test, that doesn't disprove that it is a constituent. There may be other reasons for this (we will have more to say on this later).

In the tree diagram for the sentence "Mona likes syntax" we simplified the sentence structure as a VP. This means that we believe the verb "like" to be the head that maximally projects into the VP "Mona likes syntax." This goes for all such sentences, that is we believe that it is the verb that maximally projects. Again, we are starting with a simple structure for the sentence and we will continue to refine and complexify it.

But at this stage, you may wonder what evidence we have of this. To answer this question, we need to see how syntax/sentence structure interfaces with semantics/propositional content. This will tell us not only why we think the sentence is more verb-like than noun-like, but will also explain how the syntactic system knows which lexical item in a phrase resulting from a merger operation is the head.

We have earlier defined a proposition as the part of the meaning of the sentence that constitutes a claim that can be evaluated as either true or false. This goes for what we think of the primary and most important type of sentence, the declarative

sentence (Interrogatives and Imperatives cannot be true or false; only Declarative sentences assert or claim something that can be true or false).

Earlier, we talked about thinking of intransitive verbs as needing a lexical object that carries the feature [*u*N], and transitive ones as needing two of these. This reflects that intransitive verbs need a subject, but not an object and that transitive verbs need both a subject and an object. Ditransitive verbs are said to need a subject, a direct object, and an indirect object (we will have more to say on these later in the semester).

Ok, good, let's take an example of an intransitive word and come at it from another point of entry. Take the verb "run": it is a verb that describes an action or activity undertaken by someone. Or, we can say, it is an activity that we may attribute to someone as the person doing it. As such 'run' is not complete on its own. We cannot evaluate it as true or false unless we **predicate** it from someone.

Now take the noun "Sarah" and imagine that you know who this is. Thus, it refers to a specific individual in the world. It is her name and as a *label* we may say that it is *complete* in that it suffices to pick out an individual in the world.

Now take the sentence:

26) Sarah ran.

(26) can actually be evaluated as true or false by checking the facts in the world (that is, whether Sarah did or did not run). So, we may say that the construction of the proposition is the outcome of the construction of a (declarative) sentence. Thus, the verb 'run' needs an individual for it to be evaluated as true or false. In other words, and to use the more technical terms, the verb 'run' is a **predicate** that requires one **argument** – in (26), that argument is "Sarah" – to yield a proposition that can have a truth value (either true or false). Thus, it is the verb/predicate that selects nouns/arguments and determines their number.

Thus we can translate *transitivity* into number of arguments.

Intransitive verbs require one noun/noun phrase or one argument. They are, therefore, called **1-place predicates**.

27) Sarah jumped.

Transitive Verbs require two arguments; they are thus called **2-place predicates**

28) Sarah hit her friend.

Ditransitive verbs require three arguments; thus, they are called **3-place predicates**

29) Sarah sent her friend an apology letter.

Weather verbs like rain and snow require no arguments; they are thus called **0-place predicates**.

30) It snowed.
Note that the pronoun "it" in this sentence is said to be 'empty' in that it is not an argument or does not pick out a specific individual or entity in the world.

Thus, it is the verb that is the most central element in the sentence and which determines its overall structure. Furthermore, it is the verb/predicate that selects and assigns a semantic role to the noun phrases/arguments in the sentence. We call these thematic roles or theta-roles. There are quite a few of these. Here is an example list:

A. **Agent**: the doer or the initiator of the event/action.
Sarah drove the car.
B. **Theme** (patient): something that is affected by the event/action or undergoes change as a result of it.
Sarah wrecked the car.
C. **Experiencer**: The person who feels or experiences an event.
Sarah loves cars
D. **Instrument**
Sarah smashed the window with a wrench.
E. **Goal**
Sarah gave the car to Mary.
F. **Source**
Sarah took the car from Mary.
G. **Benefactive**
Sarah bought Mary a car.
H. **Location**
Sarah parked the car in the garage.

In a sentence, some theta-roles are said to be required and others are said to be optional. Required theta-roles/arguments issue from the semantic features of the verb/predicate itself and are related to transitivity as such. Optional ones may contain important information, but are optional in the sense that the verb/predicate does not require their presence for the sentence/proposition to be complete. Observe:

31. Sarah kicked the ball in the playground.

"Sarah" is assigned the theta-role of agent and "the ball" is assigned the theta-role of theme by the verb. In a sense they are both licensed and required by the verb, but "in the playground" is not assigned its theta-role by the verb, nor does the verb require its presence (more on this later) and so is said to be optional.

Accordingly, we note that the verb must assign each of its theta-roles to a unique constituent and can assign theta-roles only to the number of arguments it requires. Thus a 2-place predicate must assign two theta-roles to two unique arguments and

can only assign two theta-roles. This means that the sentence will crash if there is more than two or if there is less than two. This is called the "**Unique Θ Generalization**" and was historically called "**the Θ-criterion**." Observe:

32. Sarah hit the ball.
33. *Sarah hit.
34. *Sarah hit the ball the table.

Sentence (32) is grammatical because it satisfies the unique Θ Generalization as the verb "hit" is a 2-place predicate which requires two arguments. The first argument, "the ball," is assigned the theta-role of Theme. The second argument, "Sarah," is assigned the theta-role of Agent. (33) is ungrammatical because the verb "hit" does not assign its Theme theta-role as the argument "Sarah" is assigned the Agent theta-role and therefore cannot be assigned another one. (34) is ungrammatical because there's one argument too many, as the verb "hit" would assign the Theme theta-role to "the ball" and the Agent theta-role to "Sarah." Therefore, the argument "the table" does not receive a theta-role which violates the unique Θ generalization resulting in the ungrammatical sentence.

Types of theta-roles a verb can assign and the number of predicates it requires/licenses is all specified in what we may call the **selectional properties** of verbs, that is, it is part of their features as they are in the lexicon before they go into the combinatorial system of syntax. Selectional features restrict the combinatorial possibilities for verbs, and other lexical items, in terms of what theta-roles they can assign or select for, and what categories of words and phrases they can merge with. The first are called semantic selectional properties (**s-selectional** properties); the latter, category selectional properties (**c-selectional** properties). We should note here that these two levels interact, but do not determine each other, i.e., the type of theta-roles a verb selects for in its arguments does not determine the grammatical category of the constituents of these arguments. Nor does the grammatical category of the constituent determine the theta-role it is assigned. Observe a verb like "see":

35. Sarah saw Omar.
36. Sara hit Omar.
37. Sarah saw that Omar was injured.
38. *Sarah hit that Omar was injured.

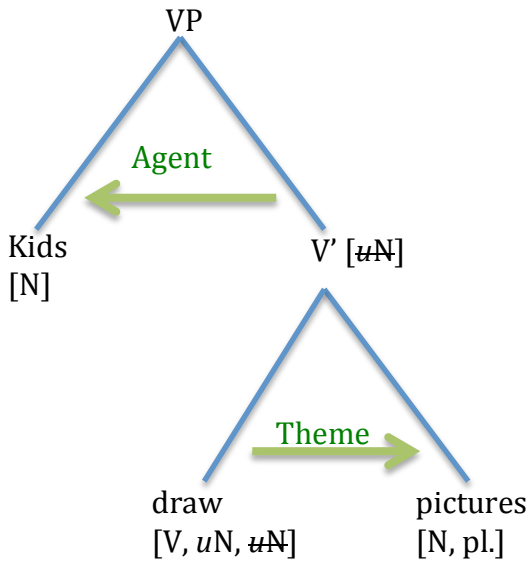
Note here the syntactic category of the 'objects' of the verbs. In (35) and (36) the syntactic category for the object is N or NP (we'll say more on this later in the semester). But in (37) *saw* selects another proposition for its object argument the syntactic category of which is Complementizer Phrase (CP).[4] Note here that the verb 'hit' cannot select a CP object, thus the ungrammaticality of (38). Thus verbs are alike in their category feature, but differ in terms of their **subcategorization** or category selectional (c-selectional) features.

[4] We haven't yet discussed the structure of such phrases, but we will later in the semester where we will argue that it is the complementizer, 'that' among others like 'if' and 'for', which heads such structures.

Let's distinguish between these two types of features of lexical items (particularly verbs in this context) as lexical items/words having features that define them as **being** of one category or another. These are the interpretable features. Thus verbs have the category [V] by virtue of being verbs. Subcategorization or c-selectional features on the other hand distinguish verbs in terms of what they need in order to construct a complete proposition. Thus, these features specify verbs as **needing** something. These are uninterpretable features. Here is a helpful analogy. Think of uninterpretable features as 'things' that the verb needs to make an omelet/proposition, 'essential ingredients' like eggs and butter. Now imagine that the verb has these on a (shopping) list. The words 'eggs' and 'butter' on the list are not the actual ingredients. They merely specify what essential ingredients the verb needs to make the omelet. Now, as such they cannot be eaten/interpreted. Once the actual items, the actual eggs and the actual butter are found we check (match and delete) the words that match them on the list. This is similar to what happens in checking in the syntax of **merger**. Once the verb merges with another lexical item, it checks its c-selectional features with the category feature of the item it merges with. If they match we delete them from the verb; if they don't, they cannot be deleted and the merger will still have uninterpretable features which means that it results in an ungrammatical structure. This is part of what we called the principle of full interpretability above.

Let's take a closer look at how this happens. Take the verb "draw." It has an interpretable feature V and c-selects two nouns or two noun-like structures, each with the interpretable feature [N]. The c-selectional features on the verb are uninterpretable and need to be checked through merger. This means that they can only be checked in **a relation of sisterhood** with a noun or a structure with the feature [N]. Observe:

39. Kids draw pictures.



In this and similar structures, we say that the verb “draw” (the **head**) first merges with the noun “pictures” (the **complement**) and since the c-selectional features of “draw” match the category feature of “pictures,” and the two are in a relation of sisterhood, we delete the uninterpretable feature on the verb which results in V’ structure “draw pictures.” That is, the V projects its category features and its remaining c-selectional [*u*N] feature onto the V’, the phrase “draw pictures. Then, V’ (“draw pictures”) merges with the noun “kids” (the **specifier**). Since, the c-selectional feature of V’ matches the category feature of “kids,” and both are in a relation of sisterhood, we can delete it. Thus, the maximal projection of the verb “draw,” i.e., the VP “Kids draw pictures” is said to be fully interpretable, that is, no uninterpretable features remain at the system of interpretation.

The diagram above also tells us something about the interface between syntax and semantics. More specifically, it tells that the predicate/verb “draw” assigns its first theta-role , viz. Theme, in the first merger operation (in a syntactic relation of sisterhood) to its complement “pictures.” And that the predicate/verb “draw” assigns its second theta-role, viz. Agent, to the noun “kids” in the second merger operation in a relation of sisterhood to the intermediate projection of the verb, or V’. Now, the verb, the two place predicate “draw,” has assigned its two theta-roles to two unique arguments. Thus, the unique theta criterion is satisfied. Accordingly, the structure is said to converge at the system of interpretation.